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(54) Title: LIQUID CLEANSING COMPOSITION COMPRISING SOLUBLE, LAMELLAR PHASE INDUCING STRUCTURANT		
<p>(57) Abstract</p> <p>The present invention relates to lamellar phase compositions comprising defined surfactant systems and a structurant selected from the group consisting of liquid fatty acids, liquid alcohols and derivatives thereof which structurant is responsible for inducing the lamellar phase. The invention also relates to a method of inducing said lamellar phase in such compositions by adding the defined structurant.</p>		

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LIQUID CLEANSING COMPOSITION COMPRISING
SOLUBLE, LAMELLAR PHASE INDUCING STRUCTURANT

BACKGROUND

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Field of the Invention

The present invention relates to liquid cleansing compositions of the type which are typically used as skin cleansing or shower gel compositions. In particular, the invention relates to lamellar phase compositions which are readily shear thinning (i.e., can suspend large particles, such as 1 micron and larger, because of their high zero shear viscosity; and yet still readily pour). In addition, the product also "heaps" on dispensing and is soft and lotion-like, thereby providing consumers a signal of enhanced moisturization.

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BACKGROUND OF THE INVENTION

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The rheological behavior of all surfactant solutions, including liquid cleansing solutions, is strongly dependent on the microstructure, i.e., the shape and concentration of micelles or other self-assembled structures in solution.

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When there is sufficient surfactant to form micelles (concentrations above the critical micelle concentration or CMC), for example, spherical, cylindrical (rod-like) or discoidal micelles may form. As surfactant concentration increases, ordered liquid crystalline phases such as lamellar phase, hexagonal phase or cubic phase may form. The lamellar phase, for example, consists of alternating surfactant bilayers and water layers. These layers are not generally flat but fold to form submicron spherical onion like structures called vesicles or liposomes. The hexagonal

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phase, on the other hand, consists of long cylindrical micelles arranged in a hexagonal lattice. In general, the microstructure of most personal care products consist of either spherical micelles; rod micelles; or a lamellar dispersion.

As noted above, micelles may be spherical or rod-like. Formulations having spherical micelles tend to have a low viscosity and exhibit newtonian shear behavior (i.e., viscosity stays constant as a function of shear rate; thus, if easy pouring of product is desired, the solution is less viscous and, as a consequence, it doesn't suspend as well). In these systems, the viscosity increases linearly with surfactant concentration.

Rod micellar solutions are more viscous because movement of the longer micelles is restricted. At a critical shear rate, the micelles align and the solution becomes shear thinning. Addition of salts increases the size of the rod micelles thereof increasing zero shear viscosity (i.e., viscosity when sitting in bottle) which helps suspend particles but also increases critical shear rate (point at which product becomes shear thinning; higher critical shear rates means product is more difficult to pour).

Lamellar dispersions differ from both spherical and rod-like micelles because they can have high zero shear viscosity (because of the close packed arrangement of constituent lamellar droplets), yet these solutions are very shear thinning (readily dispense on pouring). That is, the solutions can become thinner than rod micellar solutions at moderate shear rates.

In formulating liquid cleansing compositions, therefore, there is the choice of using rod-micellar solutions (whose

zero shear viscosity, e.g., suspending ability, is not very good and/or are not very shear thinning); or lamellar dispersions (with higher zero shear viscosity, e.g. better suspending, and yet are very shear thinning).

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To form such lamellar compositions, however, some compromises have to be made. First, generally higher amounts of surfactant are required to form the lamellar phase. Thus, it is often needed to add auxiliary surfactants and/or salts which are neither desirable nor needed. Second, only certain surfactants will form this phase and, therefore, the choice of surfactants is restricted.

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In short, lamellar compositions are generally more desirable (especially for suspending emollient and for providing consumer aesthetics), but more expensive in that they generally require more surfactant and are more restricted in the range of surfactants that can be used.

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When rod-micellar solutions are used, they also often require the use of external structurants to enhance viscosity and to suspend particles (again, because they have lower zero shear viscosity than lamellar phase solutions). For this, carbomers and clays are often used. At higher shear rates (as in product dispensing, application of product to body, or rubbing with hands), since the rod-micellar solutions are less shear thinning, the viscosity of the solution stays high and the product can be stringy and thick. Lamellar dispersion based products, having higher zero shear viscosity, can more readily suspend emollients and are typically more creamy. Again, however, they are generally more expensive to make (e.g., they are restricted as to which surfactants can be used and often require greater concentration of surfactants).

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Unexpectedly, applicants have now found that if certain liquid fatty acids (e.g., long chain, unsaturated and/or branched fatty acids); long chain, unsaturated and/or branched alcohols (e.g., oleyl alcohol or isostearyl alcohol) or derivatives (ester of fatty acids and ether of fatty alcohols) of these fatty acids and/or alcohols are used in a typical rod-micellar solution, a lamellar phase can be induced.

Specifically, applicants have found that, in compositions comprising (1) one or more anionic surfactants; (2) at least one amphoteric and/or zwitterionic surfactant; and (3) optionally, one or more nonionic surfactants; when a liquid structurant as noted above (i.e., long chain, unsaturated and/or branched liquid fatty acid; long chain unsaturated and/or branched liquid alcohols or derivatives thereof) having a melting point below about 25°C is added, the compositions become lamellar phase compositions. Further, with these specific structurants, there is no crystallization of the structurant.

The use of fatty acids generally in liquid cleansers (shower gels and shampoos) is taught, for example, in WO 94/17166 to Giret et al. (assigned to Procter & Gamble); WO 94/18737 to Cothran et al. (assigned to Procter & Gamble) and in U.S. Patent Nos. 5,132,037; 5,234,619; and 5,290,470; each to Greene et al.

Each of these references, however, teach the use of linear, saturated fatty acids (versus the unsaturated or branched fatty acids of the subject invention) which are insoluble and which crystalize in the products. Indeed, in these references, it is intended to crystallize the fatty acids since this is an important factor in the structuring, (see WO 93/18737 at page 5, lines 23-32). These references also do

not teach unsaturated or branched, long chain alcohols or their ether derivatives.

5 Dias et al. (WO 94/01084, U.S. Patent No. 5,308,526), MacGilp et al. (U.S. 5,158,699; 5,296,157; WO 92/15666) and Torres (WO 94/01085) teach the use of free fatty acids and potassium fatty acid soap where said fatty acid has an Iodine Value between 0 to 15 (i.e., iodine values indicate level of saturation of the fatty acids). In addition, there is no
10 teaching of unsaturated or branched, long chain fatty acid or alcohol.

U.S. Patent No. 5,360,581 to Rizvi et al. teach the use of a long chained saturated fatty acid (preferably C₂₂) with
15 polyethyleneimine to increase stability of the product. The fatty acid is saturated compared to the liquid, unsaturated fatty acid of the subject invention.

Japanese patent JP 7,025,726 teaches the use of liquid fatty acids in emulsion. The patent teaches compositions having
20 30% or greater oil by which is meant an emollient (e.g., vegetable oil) while the compositions of the subject invention comprise no more than about 20%, preferably no more than about 15% by wt. oil/emollient. Furthermore, JP
25 7,025,726 does not teach the use of liquid fatty acid as a structurant while the present invention utilizes the liquid fatty acid to generate the lamellar phase and thus structures the product.

30 Finally, applicants' copending application Serial No. 08/469,949 to Shana'a relates to soap composition which comprises 5 to 35% C₈ to C₂₂ fatty acid of which 20-50% must be un-neutralized (i.e., more than 50% is neutralized to form soap). The present application is a soap-free application
35 and such compositions are generally milder. Moreover, it

would not have been obvious that addition of the structurants of the subject invention in the absence of soap would yield lamellar phase compositions.

5 BRIEF SUMMARY OF THE INVENTION

The present invention relates to a liquid cleansing composition comprising a surfactant system (comprising, e.g., anionic or anionics plus amphoteric/zwitterionic), and 0.1 to 10
15 15%, preferably 0.5 to 10% by weight of a lamellar phase inducing structurant wherein said structurant is selected from the group consisting of unsaturated and/or branched, long chain (i.e., C₈ to C₂₄, preferably C₁₂ to C₂₄) liquid fatty acids or ester derivatives of these fatty acids; unsaturated
15 and/or branched, long chain (i.e., C₈ to C₂₄, preferably C₁₂ to C₂₄) liquid alcohols or ether derivatives of these alcohols.

Short chain, saturated, fatty acids (C₅ to C₉, liquid fatty acids or derivatives) can also be used though these are not
20 preferred.

In a second embodiment of the invention, the invention relates to a method of inducing the formation of a lamellar phase liquid cleaning composition comprising the surfactant
25 system described above which method comprises adding to the composition. about 0.1 to 15%, preferably 0.5 to 10% by weight of a structurant as defined above and having a melting point (MP) below about 25°C.

30 DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to liquid cleansing compositions comprising specified surfactant systems and wherein a structurant is used to induce a phase change to
35 lamellar phase composition. Such lamellar phase compositions

are preferred because they can readily suspend particles such as emollient particles (i.e., due to high zero shear viscosity) and yet readily pour out (i.e., are highly shear thinning). In addition, use of these structurants allows less surfactant to be used and provides greater versatility (i.e., can be used in many more surfactant systems of which applicants are aware) than previously possible. Further, the lamellar compositions are soft and "heap" upon dispensing thus providing a desirable and consumer pleasing rheology. The compositions are set forth in greater detail below.

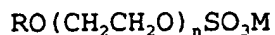
Surfactants

The surfactant system of the subject invention comprises 5 to 50% by weight, preferably 10 to 40% by wt. of the composition and comprises:

- (a) one or more anionic surfactants;
- (b) amphoteric and/or zwitterionic surfactant; and
- (c) optional nonionic surfactant

The anionic surfactant may be, for example, an aliphatic sulfonate, such as a primary alkane (e.g., C₈-C₂₂) sulfonate, primary alkane (e.g., C₈-C₂₂) disulfonate, C₈-C₂₂ alkene sulfonate, C₈-C₂₂ hydroxyalkane sulfonate or alkyl glyceryl ether sulfonate (AGS); or an aromatic sulfonate such as alkyl benzene sulfonate.

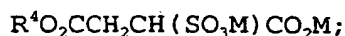
The anionic may also be an alkyl sulfate (e.g., C₁₂-C₁₈ alkyl sulfate) or alkyl ether sulfate (including alkyl glyceryl ether sulfates). Among the alkyl ether sulfates are those having the formula:



wherein R is an alkyl or alkenyl having 8 to 18 carbons, preferably 12 to 18 carbons, n has an average value of greater than 1.0, preferably between 2 and 3; and M is a solubilizing cation such as sodium, potassium, ammonium or substituted ammonium. Ammonium and sodium lauryl ether sulfates are preferred.

The anionic may also be alkyl sulfosuccinates (including mono- and dialkyl, e.g., C₆-C₂₂ sulfosuccinates); alkyl and acyl taurates, alkyl and acyl sarcosinates, sulfoacetates, C₈-C₂₂ alkyl phosphates and phosphates, alkyl phosphate esters and alkoxyalkyl phosphate esters, acyl lactates, C₈-C₂₂ monoalkyl succinates and maleates, sulphoacetates, and acyl isethionates.

Sulfosuccinates may be monoalkyl sulfosuccinates having the formula:

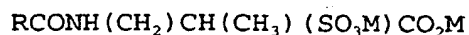


amido-MEA sulfosuccinates of the formula



wherein R⁴ ranges from C₈-C₂₂ alkyl and M is a solubilizing cation;

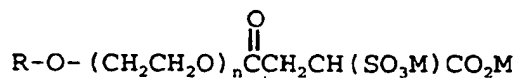
amido-MIPA sulfosuccinates of formula



where M is as defined above.

Also included are the alkoxylated citrate sulfosuccinates;

and alkoxyated sulfosuccinates such as the following:



5 wherein $n = 1$ to 20; and M is as defined above.

Sarcosinates are generally indicated by the formula
RCON(CH₃)CH₂CO₂M, wherein R ranges from C₈ to C₂₀ alkyl and M
is a solubilizing cation.

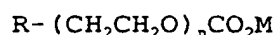
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Taurates are generally identified by formula

R²CONR³CH₂CH₂SO₃M wherein R² ranges from C₈-C₂₀ alkyl, R³ ranges
from C₁-C₄ alkyl and M is a solubilizing cation.

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Another class of anionics are carboxylates such as follows:



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wherein R is C₈ to C₂₀ alkyl; n is 0 to 20; and M is as
defined above.

Another carboxylate which can be used is amido alkyl
polypeptide carboxylates such as, for example, Monteine LCQ^(R)
by Seppic.

25

Another surfactant which may be used are the C₈-C₁₈ acyl
isethionates. These esters are prepared by reaction between
alkali metal isethionate with mixed aliphatic fatty acids
having from 6 to 18 carbon atoms and an iodine value of less
than 20. At least 75% of the mixed fatty acids have from 12
to 18 carbon atoms and up to 25% have from 6 to 10 carbon
atoms.

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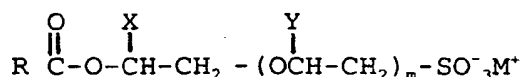
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Acyl isethionates, when present, will generally range from about 0.5-15% by weight of the total composition. Preferably, this component is present from about 1 to about 10%.

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The acyl isethionate may be an alkoxylated isethionate such as is described in Ilardi et al., U.S. Patent No. 5,393,466, hereby incorporated by reference into the subject application. This compound has the general formula:

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wherein R is an alkyl group having 8 to 18 carbons, m is an integer from 1 to 4, X and Y are hydrogen or an alkyl group having 1 to 4 carbons and M⁺ is a monovalent cation such as, for example, sodium, potassium or ammonium.

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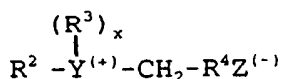
In general the anionic component will comprise from about 1 to 20% by weight of the composition, preferably 2 to 15%, most preferably 5 to 12% by weight of the composition.

Zwitterionic and Amphoteric Surfactants

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Zwitterionic surfactants are exemplified by those which can be broadly described as derivatives of aliphatic quaternary ammonium, phosphonium, and sulfonium compounds, in which the aliphatic radicals can be straight or branched chain, and wherein one of the aliphatic substituents contains from about 8 to about 18 carbon atoms and one contains an anionic group, e.g., carboxy, sulfonate, sulfate, phosphate, or phosphonate. A general formula for these compounds is:

30



wherein R² contains an alkyl, alkenyl, or hydroxy alkyl radical of from about 8 to about 18 carbon atoms, from 0 to about 10 ethylene oxide moieties and from 0 to about 1 glyceryl moiety; Y is selected from the group consisting of nitrogen, phosphorus, and sulfur atoms; R³ is an alkyl or monohydroxyalkyl group containing about 1 to about 3 carbon atoms; X is 1 when Y is a sulfur atom, and 2 when Y is a nitrogen or phosphorus atom; R⁴ is an alkylene or hydroxyalkylene of from about 1 to about 4 carbon atoms and Z is a radical selected from the group consisting of carboxylate, sulfonate, sulfate, phosphonate, and phosphate groups.

Examples of such surfactants include:

4-[N,N-di(2-hydroxyethyl)-N-octadecylammonio]-butane-1-carboxylate;

5-[S-3-hydroxypropyl-S-hexadecylsulfonio]-3-hydroxypentane-1-sulfate;

3-[P,P-diethyl-P-3,6,9-trioxatetradecylphosphonio]-2-hydroxypropane-1-phosphate;

3-[N,N-dipropyl-N-3-dodecoxy-2-hydroxypropylammonio]-propane-1-phosphonate;

3-(N,N-dimethyl-N-hexadecylammonio)propane-1-sulfonate;

3-(N,N-dimethyl-N-hexadecylammonio)-2-hydroxypropane-1-sulfonate;

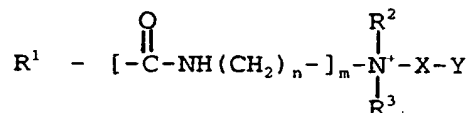
4-[N,N-di(2-hydroxyethyl)-N-(2-hydroxydodecyl)ammonio]-butane-1-carboxylate;

3-[S-ethyl-S-(3-dodecoxy-2-hydroxypropyl)sulfonio]-propane-1-phosphate;

3-[P,P-dimethyl-P-dodecylphosphonio]-propane-1-phosphonate;
and

5-[N,N-di(3-hydroxypropyl)-N-hexadecylammonio]-2-hydroxy-pentane-1-sulfate.

Amphoteric detergents which may be used in this invention include at least one acid group. This may be a carboxylic or a sulphonic acid group. They include quaternary nitrogen and therefore are quaternary amido acids. They should generally include an alkyl or alkenyl group of 7 to 18 carbon atoms. They will usually comply with an overall structural formula:



where R^1 is alkyl or alkenyl of 7 to 18 carbon atoms;

R^2 and R^3 are each independently alkyl, hydroxyalkyl or carboxyalkyl of 1 to 3 carbon atoms;

n is 2 to 4;

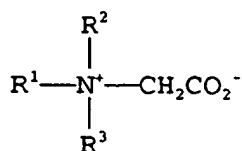
m is 0 to 1;

X is alkylene of 1 to 3 carbon atoms optionally substituted with hydroxyl, and

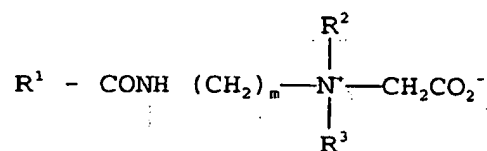
Y is $-\text{CO}_2-$ or $-\text{SO}_3-$

Suitable amphoteric detergents within the above general formula include simple betaines of formula:

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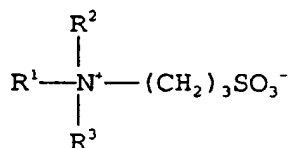
and amido betaines of formula:



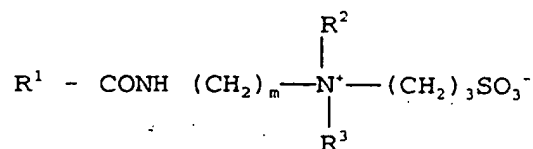
where m is 2 or 3.

In both formulae R^1 , R^2 and R^3 are as defined previously. R^1 may in particular be a mixture of C_{12} and C_{14} alkyl groups derived from coconut so that at least half, preferably at least three quarters of the groups R^1 have 10 to 14 carbon atoms. R^2 and R^3 are preferably methyl.

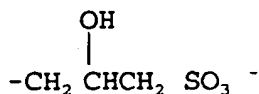
A further possibility is that the amphoteric detergent is a sulphobetaine of formula



or



where m is 2 or 3, or variants of these in which $-(\text{CH}_2)_3\text{SO}_3^-$ is replaced by



5 In these formulae R^1 , R^2 and R^3 are as discussed previously.

Amphoacetates and diamphoacetates are also intended to be covered in possible zwitterionic and/or amphoteric compounds which may be used.

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The amphoteric/zwitterionic generally comprises 0.1 to 20% by weight, preferably 5% to 15% of the composition.

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In addition to one or more anionic and amphoteric and/or zwitterionic, the surfactant system may optionally comprise a nonionic surfactant.

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The nonionic which may be used includes in particular the reaction products of compounds having a hydrophobic group and a reactive hydrogen atom, for example aliphatic alcohols, acids, amides or alkyl phenols with alkylene oxides, especially ethylene oxide either alone or with propylene oxide. Specific nonionic detergent compounds are alkyl (C_6 - C_{22}) phenols-ethylene oxide condensates, the condensation products of aliphatic (C_8 - C_{18}) primary or secondary linear or branched alcohols with ethylene oxide, and products made by condensation of ethylene oxide with the reaction products of propylene oxide and ethylenediamine. Other so-called nonionic detergent compounds include long chain tertiary amine oxides, long chain tertiary phosphine oxides and dialkyl sulphoxides.

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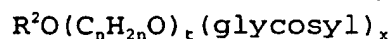
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The nonionic may also be a sugar amide, such as a polysaccharide amide. Specifically, the surfactant may be one of the lactobionamides described in U.S. Patent No. 5,389,279 to Au et al. which is hereby incorporated by

reference or it may be one of the sugar amides described in Patent No. 5,009,814 to Kelkenberg, hereby incorporated into the subject application by reference.

5 Other surfactants which may be used are described in U.S. Patent No. 3,723,325 to Parran Jr. and alkyl polysaccharide nonionic surfactants as disclosed in U.S. Patent No. 4,565,647 to Llenado, both of which are also incorporated into the subject application by reference.

10 Preferred alkyl polysaccharides are alkylpolyglycosides of the formula



15 wherein R^2 is selected from the group consisting of alkyl, alkylphenyl, hydroxyalkyl, hydroxyalkylphenyl, and mixtures thereof in which alkyl groups contain from about 10 to about 18, preferably from about 12 to about 14, carbon atoms; n is 20 0 to 3, preferably 2; t is from 0 to about 10, preferably 0; and x is from 1.3 to about 10, preferably from 1.3 to about 2.7. The glycosyl is preferably derived from glucose. To prepare these compounds, the alcohol or alkylpolyethoxy alcohol is formed first and then reacted with glucose, or a 25 source of glucose, to form the glucoside (attachment at the 1-position). The additional glycosyl units can then be attached between their 1-position and the preceding glycosyl units 2-, 3-, 4- and/or 6-position, preferably predominantly the 2-position.

30 Nonionic comprises 0 to 10% by wt. of the composition.

In general, the compositions of the invention are soap-free compositions. The generation of lamellar phase in such soap-free composition was completely unexpected.

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Structurant

The present invention provides compositions utilizing about 0.1% to 15% by wt., preferably 1 to 10% by wt. of a structuring agent which works in the compositions to form a lamellar phase. Such lamellar phase is preferred because it enables the compositions to suspend particles more readily (e.g., emollient particles) while still maintaining good shear thinning properties. The lamellar phase also provides consumers with desired rheology ("heaping").

More particularly, where the composition is not lamellar structured and enhanced particle suspension/enhancing is desired, it is usually necessary to add external structurants such as carbomers (e.g., cross-linked polyacrylate such as Carbopol^(R)) and clays. However, these external structurants have poorer shear thinning properties that significantly reduce consumer acceptability.

The structurant is generally an unsaturated and/or branched long chain (C_8 - C_{24}) liquid fatty acid or ester derivative thereof; and/or unsaturated and/or branched long chain liquid alcohol or ether derivatives thereof. It may also be a short chain saturated fatty acid such as capric acid or caprylic acid. While not wishing to be bound by theory, it is believed that the unsaturated part of the fatty acid of alcohol or the branched part of the fatty acid or alcohol acts to "disorder" the surfactant hydrophobic chains and induce formation of lamellar phase.

Examples of liquid fatty acids which may be used are oleic acid, isostearic acid, linoleic acid, linolenic acid, ricinoleic acid, elaidic acid, arichidonic acid, myristoleic acid and palmitoleic acid. Ester derivatives include propylene glycol isostearate, propylene glycol oleate,

glyceryl isostearate, glyceryl oleate and polyglyceryl diisostearate.

5 Examples of alcohols include oleyl alcohol and isostearyl alcohol. Examples of ether derivatives include isosteareth or oleth carboxylic acid; or isosteareth or oleth alcohol.

The structuring agent may be defined as having melting point below about 25°C centigrade.

10 Oil/Emollient

One of the principle benefits of the invention is the ability to suspend oil/emollient particles in a lamellar phase composition.

Various classes of oils are set forth below.

20 Vegetable oils: Arachis oil, castor oil, cocoa butter, coconut oil, corn oil, cotton seed oil, olive oil, palm kernel oil, rapeseed oil, safflower seed oil, sesame seed oil and soybean oil.

25 Esters: Butyl myristate, cetyl palmitate, decyloleate, glyceryl laurate, glyceryl ricinoleate, glyceryl stearate, glyceryl isostearate, hexyl laurate, isobutyl palmitate, isocetyl stearate, isopropyl isostearate, isopropyl laurate, isopropyl linoleate, isopropyl myristate, isopropyl palmitate, isopropyl stearate, propylene glycol monolaurate, 30 propylene glycol ricinoleate, propylene glycol stearate, and propylene glycol isostearate.

Animal Fats: Acetylalate lanolin alcohols, lanolin, lard, 35 mink oil and tallow.

Fatty acids and alcohols: Behenic acid, palmitic acid, stearic acid, behenyl alcohol, cetyl alcohol, eicosanyl alcohol and isocetyl alcohol.

- 5 Other examples of oil/emollients include mineral oil, petrolatum, silicone oil such as dimethyl polysiloxane, lauryl and myristyl lactate.

10 It should be understood that where the emollient may also function as a structurant, it should not be doubly included such that, for example, if the structurant is 15% oleyl alcohol, no more than 5% oleyl alcohol as "emollient" would be added since the emollient (whether functioning as emollient or structurant) never comprises more than 20%,
15 preferably no more than 15% of the composition.

The emollient/oil is generally used in an amount from about 1 to 20%, preferably 1 to 15% by wt. of the composition. Generally, it should comprise no more than 20% of the
20 composition.

In addition, the compositions of the invention may include optional ingredients as follows:

- 25 Organic solvents, such as ethanol; auxiliary thickeners, such as carboxymethylcellulose, magnesium aluminum silicate, hydroxyethylcellulose, methylcellulose, carbopols, glucamides, or Antil^(R) from Rhone Poulenc; perfumes; sequestering agents, such as tetrasodium
30 ethylenediaminetetraacetate (EDTA), EHDP or mixtures in an amount of 0.01 to 1%, preferably 0.01 to 0.05%; and coloring agents, opacifiers and pearlizers such as zinc stearate, magnesium stearate, TiO₂, EGMS (ethylene glycol monostearate)

or Lytron 621 (Styrene/Acrylate copolymer); all of which are useful in enhancing the appearance or cosmetic properties of the product.

5 The compositions may further comprise antimicrobials such as 2-hydroxy-4,2'4' trichlorodiphenylether (DP300); preservatives such as dimethyloldimethylhydantoin (Glydant XL1000), parabens, sorbic acid etc.

10 The compositions may also comprise coconut acyl mono- or diethanol amides as suds boosters, and strongly ionizing salts such as sodium chloride and sodium sulfate may also be used to advantage.

15 Antioxidants such as, for example, butylated hydroxytoluene (BHT) may be used advantageously in amounts of about 0.01% or higher if appropriate.

20 Cationic conditioners which may be used include Quatrisoft LM-200 Polyquaternium-24, Merquat Plus 3330 - Polyquaternium 39; and Jaguar^(R) type conditioners.

Polyethylene glycols which may be used include:

25	Polyox	WSR-205	PEG 14M,
	Polyox	WSR-N-60K	PEG 45M, or
	Polyox	WSR-N-750	PEG 7M.

30 Thickeners which may be used include Amerchol Polymer HM 1500 (Nonoxynyl Hydroethyl Cellulose); Glucam DOE 120 (PEG 120 Methyl Glucose Dioleate); Rewoderm^(R) (PEG modified glyceryl cocoate, palmate or tallowate) from Rewo Chemicals; Antil^(R) 141 (from Goldschmidt).

35

Another optional ingredient which may be added are the defloculating polymers such as are taught in U.S. Patent No. 5,147,576 to Montague, hereby incorporated by reference.

5 Another ingredient which may be included are exfoliants such as polyoxyethylene beads, walnut sheets and apricot seeds

10 In a second embodiment of the invention, the invention relates to a method of inducing the formation of lamellar phase liquid compositions comprising:

- (a) Surfactant system as defined above (i.e., one or more anionics, amphoteric/zwitterionic and optional nonionic); and
- 15 (b) Emollient/oil as defined above;

which method comprises adding to the composition 0.1 to 20%, preferably 0.1 to 15% by wt. of a structurant as defined above.

20 In general, the surfactants are mixed uniformly at elevated temperatures (150 to 180°F) with deionized water. To this are added the auxiliary thickeners, emollient oils, the structurant, the preservatives, and antioxidants. The mixture is mixed to uniformity and then cooled to 90°-95°F. Perfume and other temperatures sensitive ingredients (colors) are added at around 100°-120°F as it is being cooled. The structurant and the emollient oils can also be added at the low temperatures as it is being cooled.

30 The invention will now be described in greater detail by way of the following non-limiting examples. The examples are for illustrative purposes only and not intended to limit the invention in any way.

35

All percentages in the specification and examples are intended to be by weight unless stated otherwise.

EXAMPLES I - IX

Compositions I-IX below were prepared as follows:

Surfactants were mixed at 150-180°F with deionized water followed by addition of auxiliary thickeners, emollient oils, the structurant, preservatives and antioxidants. The mixture was mixed to uniformity and cooled to 90-95°F. Perfumes and sensitives (e.g., colors) were added at about 100-120°F as it was being cooled. Structurant and emollient oils can also be added at lower temperatures.

Compositions I-IX are set forth below:

In each case addition of structurant caused formation of lamellar phase. It should be noted that structurant was used in a variety of surfactant systems, always with the same result, i.e., induction of lamellar phase.

EXAMPLES X, XI AND COMPARATIVE EXAMPLES A - O

A 20% active surfactant solution consisting of 10% betaine, 5% sodium cocoyl isethionate and 5% sodium laureth sulfate was prepared. A drop of this solution was placed between a microscope slide and a cover slip. The test materials set out in the table were then contacted with the surfactant solution. In cases where the test material becomes a solid at room temperature, the slide was heated to slightly above the melting point of the test material. The interface between the surfactant solution and the test material was then examined under an optical microscope between cross-polarizers. The phases were then identified based on the

5 birefringence. In particular, the lamellar phase is characterized by a focal conic oily streak type texture and the crystalline phase by a sharp characteristic crystalline texture. The contact preparation described above is a standard method to screen materials for their ability to form liquid crystalline phases.

10 Based on the experimental methodology set forth, the selected test materials X, XI and were analyzed and results set forth below:

Test Material	Example	Does Lamellar Phase Form at Room Temperature?
Oleyl Alcohol	X	Yes, Lamellar Texture
Isostearic Acid	XI	Yes, Lamellar Texture
Stearyl Alcohol	A	No. The Stearyl Alcohol Crystallizes out
Cetyl Alcohol	B	No. Cetyl Alcohol Crystallises out
Behenyl Alcohol	C	No. Behenyl Alcohol Crystallises out
Stearic Acid	D	No. Stearic Acid Cryaliizes out
Isopropyl myristate	E	No. Optically Isotropic
Isopropyl palmitate	F	No. Optically Isotropic
Lauryl Lactate	G	No. Optically Isotropic
Myristyl myristate	H	No. Optically Isotropic
Mink Oil	I	No. Optically Isotropic
Dimethicone (Polydimethyl siloxane)	J	No. Optically Isotropic
Olive Oil	K	No. Optically Isotropic
Soybean Oil	L	No. Optically Isotropic
Sunflower Seed Oil	M	No. Optically Isotropic
Castor Oil	N	No. Optically Isotropic
Polyethylene Glycol (MW = 1450)	O	No. Optically Isotropic

The results indicated that many forms of structurant cannot act to induce lamellar phase, whereas those of the invention successfully induce the lamellar phase.

CLAIMS

We claim:

- 5 1. A liquid cleansing composition comprising
- (a) 5% to 50% by wt. of a surfactant system
 comprising:
- 10 (i) an anionic surfactant or mixture of anionic
 surfactants; and
 (ii) an amphoteric and/or zwitterionic surfactant
 or mixture thereof;
- 15 (b) about 0.1 to 15% by wt. of a lamellar phase
 inducing structurant which is selected from the
 group consisting of
- (i) C₈ to C₂₄ unsaturated and/or branched liquid
20 fatty acid or ester thereof;
 (ii) C₈ to C₂₄ unsaturated and/or branched liquid
 alcohol or ether thereof; and
 (iii) C₅ to C₉ saturated fatty acids;
- 25 wherein said structurant has a melting point below
 about 25°C;
 said composition comprising no more than 20% by
 weight emollient.
- 30 2. A composition according to claim 1, comprising 1% to 20%
 by wt. of an emollient.
3. A composition according to claim 1, wherein the
 surfactant system further comprises a nonionic
35 surfactant or mixture of nonionic surfactants.

4. A composition according to claim 1, wherein the liquid fatty acid is oleic acid.
5. A composition according to claim 1, wherein the liquid fatty acid is isostearic acid.
6. A composition according to claim 1, wherein the liquid fatty acid is an ester derivative of fatty acid selected from the group consisting of propylene glycol isostearate, propylene glycol oleate, glyceryl isostearate, glycerol oleate and polyglyceryl diisostearate.
7. A composition according to claim 1, wherein the liquid alcohol structurant is oleyl alcohol.
8. A composition according to claim 1, wherein the liquid alcohol structurant is isostearyl alcohol.
9. A composition according to claim 1, wherein the emollient is silicone.
10. A composition according to claim 1, wherein the emollient is a vegetable oil.
11. A composition according to claim 1, wherein the emollient is an ester.
12. A method for inducing a lamellar phase in a composition comprising:
- (a) 5% to 80% by wt. of a surfactant system comprising:

- (i) an anionic surfactant or mixture of anionic surfactants; and
- (ii) an amphoteric and/or zwitterionic surfactant; and

5

- (b) no more than 20% by wt. emollient; which method comprises adding about 0.1 to 15% by wt. of a structurant selected from the group consisting of:

10

- (i) C_8 to C_{24} unsaturated and/or branched liquid fatty acid or ester thereof;
- (ii) C_8 to C_{24} unsaturated and/or branched liquid alcohol or ether thereof; and
- (iii) C_5 to C_9 saturated fatty acids;

15

wherein said structurant has a melting point below about 25°C.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 96/03284

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61K7/50

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO,A,96 02229 (UNILEVER PLC ;UNILEVER NV (NL)) 1 February 1996 see the whole document	1-4,7, 9-12
X	EP,A,0 530 708 (ALBRIGHT & WILSON) 10 March 1993 see page 1-10, line 30 see page 11, line 45-58 see page 12, line 1-7 see claims 1,2,4,17,20,24,31,33,33	1-3,10, 12
X	LU,A,76 121 (JOHNSON & JOHNSON) 18 May 1977 see the whole document	1,3
A	FR,A,2 408 387 (L'OREAL) 8 June 1979 see the whole document	1-12
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
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T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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G document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Internat. Application No
PCT/EP 96/03284

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR,A,2 694 494 (RHONE POULENC CHIMIE) 11 February 1994 see the whole document ---	1-12
A	WO,A,92 05234 (PROCTER & GAMBLE) 2 April 1992 see page 20, line 29-39; claims 1-9 -----	1-12

INTERNATIONAL SEARCH REPORT

 Internat Application No
 PCT/EP 96/03284

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A-9602229	01-02-96	AU-A- 2985795 CA-A- 2186017	16-02-96 01-02-96
EP-A-0530708	10-03-93	AU-B- 665766 AU-A- 2133092 BG-A- 96827 CA-A- 2077253 CN-A- 1073973 GB-A,B 2259519 IL-A- 102950 JP-A- 5209198 NZ-A- 244159 ZA-A- 9206551	18-01-96 11-03-93 24-03-94 01-03-93 07-07-93 17-03-93 31-03-96 20-08-93 22-12-94 08-06-93
LU-A-76121	18-05-77	US-A- 4177171 AU-B- 501674 AU-A- 1896476 BE-A- 847944 CA-A- 1074232 GB-A- 1540301 JP-C- 1237893 JP-A- 52057213 JP-B- 59010720 NL-A- 7612151	04-12-79 28-06-79 04-05-78 03-05-77 25-03-80 07-02-79 31-10-84 11-05-77 10-03-84 05-05-77
FR-A-2408387	08-06-79	FR-A- 2315991 BE-A- 871908 DE-A- 2849710 GB-A,B 2008433 NL-A,B,C 7811298 US-A- 4772471 US-A- 4897308 US-A- 5021200 US-A- 4217344 AT-B- 361896 AT-B- 361893 AU-B- 505843 AU-A- 1539376 BE-A- 843300 CA-A- 1063908	28-01-77 10-05-79 03-01-80 06-06-79 17-05-79 20-09-88 30-01-90 04-06-91 12-08-80 10-04-81 10-04-81 06-12-79 05-01-78 23-12-76 09-10-79

INTERNATIONAL SEARCH REPORT

 Internat Application No
 PCT/EP 96/03284

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A-2408387		CH-A- 623236	29-05-81
		CH-A- 616087	14-03-80
		DE-A- 2629100	20-01-77
		DE-C- 2660069	13-09-90
		DE-C- 2661108	16-12-93
		DK-B- 168812	20-06-94
		GB-A- 1539625	31-01-79
		JP-C- 1393036	11-08-87
		JP-A- 56108528	28-08-81
		JP-B- 61056016	01-12-86
		JP-C- 1175162	28-10-83
		JP-A- 52006375	18-01-77
		JP-B- 58008287	15-02-83
		NL-A,C 7607210	03-01-77
		NL-A,B,C 8102794	02-11-81

FR-A-2694494	11-02-94	EP-A- 0586275	09-03-94
		JP-B- 2548074	30-10-96
		JP-A- 6157239	03-06-94
		US-A- 5556628	17-09-96

WO-A-9205234	02-04-92	CN-A- 1061151	20-05-92
		NZ-A- 239879	27-06-94

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